

I wish to express grateful appreciation to the following members of the Arnold Arboretum staff,—to Dr. A. C. Smith, Curator of the Herbarium, for the loan of specimens, to Mr. Ernest J. Palmer for reviewing my study, and to Dr. Leon Croizat for valuable assistance given me in the preparation of the Latin descriptions in this manuscript. I wish, also, to express gratitude to Mrs. E. J. Walker of La Joya, Hidalgo County, for the excellent material of *Forestiera texana* which she sent to me.

Texas Agricultural Experiment Station,  
Substation 14, Sonora, Texas,  
March, 1944.

## REVIEWS

*The Flowering Plants and Ferns of Mount Diablo, California.* By MARY L. BOWERMAN. Pp. xi + 290, frontis. + 26 figs. Gillick Press, Berkeley, California, 1944. \$3.75.

Miss Bowerman's intensive survey of the flora of the Mount Diablo region of central coastal California is divided into two sections: first, an introductory discussion dealing with physical factors, concepts and descriptions of plant communities, and floristic relations, and second, an annotated catalogue of the vascular plants.

The catalogue constitutes the main contribution of Miss Bowerman's book. The accounts of species contain data on habitat, altitudinal range, abundance, period of blooming, associates, and local distribution. Keys to families, genera, and species are included, as are also bibliography, glossary, and index. To an ecologist interested in plant-animal interrelations, this catalogue is the best kind of guide to a local flora and provides sound groundwork for evaluation of such interrelations. Those accounts dealing with dominant species, such as the oaks, are especially significant. The factual information appears clearly set forth and constitutes a valuable storehouse of data for plant geographers and systematists.

Attention is here directed to the section of Miss Bowerman's book dealing with ecological aspects of the vegetation, occupying pages 17 to 63, and consisting chiefly of descriptions of plant aggregations of several orders, listed as formations, associations, and societies, together with observations on succession in woodland, grassland, and chaparral. These descriptions and observations are relatively brief and entirely qualitative; they are thus of a preliminary character. Commendable reserve is shown in the treatment of this section, as, for instance, in the use of only the three community terms mentioned above without any attempt to distinguish successional from climax units. Further, the author points out that plant communities of the Coast Ranges are unusu-

ally variable and that "many areas need to be described before synthesis into larger groups can be satisfactorily completed." I share the author's opinion that ecological investigation of Californian vegetation has lagged, and my own comments are an attempt to reinforce and extend the many interesting questions brought up by her survey of the plant communities of Mount Diablo.

To analyze any plant-animal community and its present-day as well as historical relations, investigators are obliged to sample it at many points and to evaluate the contents of all areas occupied by the community in terms of its distributional metropolis. How, for instance, does the *Quercus agrifolia-Aesculus* Association of Bowerman fit into the larger picture of the broad sclerophyll formation along the coast from Mendocino County south at least to Los Angeles County? Bowerman's main discussion is understandably confined to the Mount Diablo region, but at times this needs emphasis. Thus, she rejects Cooper's designation of the *Quercus agrifolia-Arbutus* Association and states (p. 22) that "*Aesculus* . . . is more characteristic than *Arbutus Menziesii*." She means, of course, that this is true in the Mount Diablo region. If we refer to Cooper (Carnegie Inst. Publ. 319, 1922: 23), we find him quite cognizant of variance: "The characteristic tree is *Quercus agrifolia*. *Arbutus* . . . is next in importance, but *varies greatly in abundance* in different localities. *Aesculus* . . . is usually prominent, and *Umbellularia* . . . is equally so." (Italics mine.) I cite this as a fairly typical example of the futile sort of disagreement that appears in papers dealing with community ecology. Each investigator's ideas, impressions, and conclusions are of course colored by the area with which he is most familiar; obviously, what is strikingly true in a local portion of one association may or may not be true over the remaining geographic area of that association. Yet this is overlooked. Miss Bowerman's association may represent a faciation in the larger unit of Cooper.

Other questions come up concerning the community units: (1) The occurrence of *Pinus Coulteri* on Mount Diablo is marginal; its plant associates are in part drawn from, for instance, the *Quercus agrifolia-Aesculus* Association. Just what the status of this pine community is in relation to the main geographic area of *P. Coulteri* still remains to be determined. One wonders whether the patch of Coulter pines on Mount Diablo, relatively insignificant from a strictly ecological point of view, should rank there as an association. (2) Bowerman recognizes a broad sclerophyll formation and a deciduous oak-conifer formation. Shall we add a third equivalent unit from the Californian flora, a broad sclerophyll-conifer formation, such as occurs on the eastern slopes of the Sierra Nevada in Inyo County? These seem to me more logically lumped into one woodland formation. The author's own placement of the *Quercus Wislizenii* Association into the deciduous oak-

conifer formation (p. 27) is a sample of the sort of inconsistency that results when several woodland formations are recognized. The fundamental question here concerns the concept of formation, and admittedly this is not clarified easily using as an example the woodland which, in its climax form, contains narrow sclerophylls, broad sclerophylls, and deciduous species. (3) When the author states (p. 20) that "associations . . . differ from each other floristically," she surely means this only in a partial sense, as the associations of, for instance, the chaparral formation differ ecologically as well.

We may profitably ask ourselves, what in the last analysis does the plant ecologist investigate? From one point of view, the answer is growth-form or life-form. Investigations may be directed toward descriptions, factor relations, community interrelations, or succession, but whatever the approach, it seems to me that mainly we study the vegetational mass, the physiological character of its dominant and subordinate species, and the environmental forces leading to particular responses as reflected in life-form. Miss Bowerman suggests this point of view when, in discussing indicator species (p. 17), she states that "even more important than the actual species is the facies of the vegetation." To differentiate kinds of vegetation in terms of facies, or physiognomy, we have used the concept of formation. Underlying this concept are three important considerations: dominant life-forms of the vegetation, their reflection of the nature of habitat, and their influence on the nature of interspecific relations—all obviously fundamental considerations. It is therefore surprising to read here (p. 19), as part of a general discussion of distributional units, that "in some areas the life-zone [or climatic zone] may represent a more fundamental unit than the formation." On Mount Diablo, Miss Bowerman finds the climate fairly uniform; she emphasizes that there physiographic factors strongly influence the vegetation. But to argue that "the placing of woodland, grassland, and chaparral [all present on Mount Diablo] into different formations separates them artificially" seems to me to confuse the reader as to the bases of plant-ecological inquiry. The fact that three different formations occur within one climatic zone is no argument for minimizing the significance of the concept of formation. If in the course of the complex history of Californian vegetation one climatic zone comes to support such diverse, dominant, and apparently climax plant types, we have a situation which offers an exceptional challenge for analysis; we cannot dispose of it by simply applying the term "Upper Sonoran Zone."

Only brief comment can be added on one other problem of a general character touched upon by Miss Bowerman: A discussion of indicator species (p. 17) closes with the interesting statement that "Transition[-Zone] species are not associated one with another on Mount Diablo, nor are they confined to one part of the

mountain." Californian botanists have long been concerned with "indicator" species, and critical analyses such as Miss Bowerman's may place this concept into better perspective among fundamental problems of ecology.

Especially to those familiar with the Californian flora, Miss Bowerman's descriptions and discussions of Mount Diablo plant communities should prove provocative. This part of her work augments the value of the catalogue and floristic analysis. The book is attractively printed and bound; the photographs are well reproduced. Altogether Miss Bowerman's work represents an important, useful contribution, the merits of which will be appreciated increasingly as other local Pacific Coast floras are analyzed and correlated.—FRANK A. PITELKA, Museum of Vertebrate Zoology, University of California, Berkeley.

#### NOTES AND NEWS

**TWO CARICES NEW TO MONTANA.** Two sedges collected in 1941 in the Vigilante Experimental Range, Madison County, Montana, a branch of the Northern Rocky Mountain Forest Range and Experiment Station of the United States Forest Service, were identified by F. J. Hermann who suggested that they were new to Montana. Specimens herein cited are filed both in the United States Forest Service Herbarium in Washington, D. C., and in the United States National Arboretum Herbarium, Bureau of Plant Industry, Soils and Agricultural Engineering, Beltsville, Maryland.

**CAREX EBENEA** Rydb., according to Mackenzie (Cyperaceae, in North American Flora 18: 1-472. 1931-1935), occurs in "mountain meadows, Wyoming to Utah, and southward to New Mexico and Arizona." The type was collected on Pike's Peak, Colorado. The Montana specimens were collected in moist "springy" muck in a mountain meadow at 8000 feet elevation, approximately 1500 feet below true climatic timberline (*Lemon and Evanko PL-120*). Plants 1.5 to 2.5 dm. tall were relatively common here and flowered in June.

**CAREX EPAPILLOSA** Mackenzie is given (op. cit.) as occurring in "mountain meadows, Wyoming to Washington, and southward to Utah and California." The type was collected in Utah. The Montana specimens were collected at 9000 feet elevation, about 500 feet below true climatic timberline, in moderately moist, gravelly loam in subalpine grassland (*Lemon PL-162*). Plants 3 to 6 dm. in height flowered in July. This species was associated with *Festuca idahoensis* Elmer and species of *Sieversia*.—PAUL C. LEMON, Appalachian Forest Experiment Station, United States Forest Service.